

IN THE CLAIMS

Claim 1. A method for processing a substrate with plasma, comprising the steps of:
positioning the substrate in a processing chamber;
supplying a high frequency power to a substantially planar spiral antenna from a central area thereof and generating an induced electric field in the processing chamber;
generating a plasma in said processing chamber; and
shaping said induced electric field with respect to said substrate so as to achieve a uniform distribution of said plasma on said substrate.

Claim 2. The method according to claim 1, wherein:
said supplying step includes supplying the high frequency power to the spiral antenna and impedance matching an output of a high frequency power supply to an input of said spiral antenna.

Claim 3. The method according to claim 1, further comprising a step of controlling supply of the high frequency power by a controller.

Claim 4. The method according to claim 1, wherein:
said supplying step comprises,
generating an alternating magnetic field having flux lines that pass through a dielectric member disposed between said spiral antenna and said substrate in said processing chamber.

Claim 5. The method according to claim 1, wherein:
said supplying step comprises,

supplying the high frequency power to said spiral antenna which includes a plurality of curved antenna segments having inner ends which are positioned at the central area.

Claim 6. The method according to claim 5, wherein:

said supplying step comprises,

supplying the high frequency power to said curved antenna segments, each of said curved antenna segments spiraling radially outward in a same direction, said direction being either clockwise or counterclockwise.

Claim 7. The method according to claim 1, wherein:

said shaping step includes,

disposing a paramagnetic plate under said spiral antenna.

Please add new claims 8-18 as follows:

Claim 8. A method for processing a substrate by a plasma processing apparatus including a processing chamber, a susceptor having a supporting area for supporting the substrate in the processing chamber, a spiral antenna having at least two elongated members, each of the members having an inner end and an outer end and outwardly extending from a central area of the processing chamber, and a dielectric member positioned between the supporting area of the susceptor and the spiral antenna, the method comprising:

supporting the substrate in the supporting area of the susceptor;

introducing a processing gas into the processing chamber;

supplying a high frequency power to one of the inner and the outer end of each of the elongated members to generate an induced electric field in the processing chamber; and

generating a plasma in the processing chamber;

wherein each of the at least two elongated members is a separate member separately supplied with high frequency power.

Claim 9. The method according to claim 8. wherein said supplying comprises:
supplying the high frequency power to the inner end of each of the elongated members.

Claim 10. The method according to claim 8, wherein said supplying comprises:
supplying the high frequency power to one of the inner end and the outer end of each of the elongated members through a matching circuit.

Claim 11. The method according to claim 8. wherein turns of the spiral antenna are arranged so that a pitch of the turns in a central region is greater than a pitch in an outer region.

Claim 12. A method for processing a substrate by a plasma processing apparatus, comprising
positioning the substrate in a processing chamber;
applying a high frequency power to inner end portions of a plurality of elongated members of a spiral antenna, the inner end portions of the elongated members being positioned in a central area of the spiral antenna, and the elongated members be in outwardly extended from the central area in a curved shape to generate an induced electric field in the processing chamber; and
generating a plasma in the processing chamber to process the substrate;

wherein each of the plurality of elongated members is a separate member separately supplied with high frequency power.

Claim 13. The method according to claim 12, wherein said applying the high frequency power comprises:

supplying high frequency power to the inner end of each of the elongated members through a matching circuit.

Claim 14. The method according to claim 12, wherein turns of the spiral antenna are arranged so that a pitch of the turns in a central region is greater than a pitch in an outer region.

Claim 15. The method according to claim 12, wherein each of the elongated members of the spiral antenna is extended along a surface of the processing chamber.

Claim 16. The method according to claim 15, wherein each of the elongated members comprises a flat elongated surface that is in contact with the surface of the processing chamber.

Claim 17. The method according to claim 1, wherein the substantially planar spiral coil is a continuous coil.

Claim 18. The method according to claim 1, wherein the substantially planar spiral coil comprises at least two elongated members that are separated in a radial direction.